

REMARKS

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The rejections and comments of the Examiner set forth in the Office Action dated August 25, 2003 have been carefully reviewed by the Applicants. Claims 16-35 are currently pending in the application with Claims 16-18 and 20-27 currently rejected and Claims 19 and 28-35 having been allowed. The Applicants thank the Examiner for the allowance of Claims 19 and 28-35.

Claims 16-18 and 20-27 are currently rejected under 35 U.S.C. 103(a) as being unpatentable over different combinations of references, each involving the combination of Acovic (US 5315142) in view of Lin (US 6127226). The Applicants respectfully traverse the rejection on the grounds that the combination of Acovic and Lin would not be obvious to one with normal skill in the art.

Lin has been relied upon as teaching "sidewall doping" and used in combination with Acovic. One with normal skill in the art would not find motivation to combine Lin with Acovic in either reference. Acovic and the present invention are directed to horizontal transistor devices, in which the current flow is in channel underneath the bottom of the trench. Lin is directed to a

vertical transistor device, with a channel that is adjacent to the sidewalls, not underneath the bottom of the trench. The sidewall

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doping of the present invention is used to reduce coupling between the source and drain regions and the control gate, not adjust the threshold voltage (see page 3, lines 16-18). Lin teaches an implant to adjust threshold voltage in a vertical device and does not teach an implant to decouple the source and drain from the control gate.

Lin teaches the implanting of sidewalls in order to adjust a threshold voltage. However, implanting the sidewalls of the device

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of Acovic would not adjust the threshold voltage since the channel is at the bottom of the trench, not in the sidewalls. Based upon the teaching of adjusting threshold voltages by implant, one with normal skill in the art would not find a motivation in Lin to implant the sidewalls of Acovic.

The response to the Applicants' prior arguments holds that Lin's invention also covers horizontal transistors in which the current flow is in a channel underneath the bottom of the trench. The Applicants are referred to column 4, lines 55-63 and column 5, lines 59-61.

Figures 1-10 of Lin all refer to the fabrication and structure of the same device and Figures 11-13 show the current flow for that device. Figures 11-13 and the associated description at column 6, lines 26-46 clearly teach that the current flow in the device of Lin is not in a channel under the trench, but in a channel that is adjacent to the sidewalls.

Most importantly, the lack of a channel under the trench in the device of Lin is explicitly described as items 1 and 2 in the summary of the invention at column 1, lines 36-37:

"1. A cell structure in accordance with this invention uses a vertical channel but not the traditional horizontal one."

"2. A cell structure in accordance with this invention can be packed more densely for a cell array since the channel is vertical with respect to the wafer surface."

The sole reason provided by Lin for the doping of a sidewall is to adjust a threshold voltage. Since doping of the sidewall in

Acovic would not adjust the threshold voltage, there is no motivation provided for doping the sidewall of Acovic.

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In summary, the Applicants assert that Claims 16-18 and 20-27 are in condition for allowance, and earnestly solicit such action by the Examiner.


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Respectfully submitted,

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